THE REGIONAL MUNICIPALITY OF WATERLOO

17/11/1

Staff Report

To

Planning and Development Committee

COMMISSIONER - BILL THOMSON

SUBJECT: 2001 Regional Population Forecast, Regional Municipality of Waterloo

NUMBER: PD 22/80

DATE: February 27, 1980

INTRODUCTION:

The Regional Official Policies Plan contains a commitment to annually review population trends in the Region as well as outside pressures on Regional population growth in order to determine the consequences of forecasted growth.

Since approval of the Regional Official Policies Plan in December 1976, Regional staff have submitted two such reviews to Planning and Development Committee, the first in 1977 1/ and the second in 1978. 2/ The present report for 1979 is the third such report and continues the process of review in the light of recent population figures from the 1979 assessment.

Since the preparation of the first Regional population forecasts in 1976 several of the underlying factors determining population size and composition have changed dramatically. The technique which has been used for forecasting population relies on three critical determining factors, each of which is influenced by a number of related social, economic, political and psychological factors. These prime factors are:

Birth Rates: Births per 1000 women of child-bearing years, defined as females between 15 and 49 years of age.

Death Rates: Deaths per 1000 population by five year age groupings.

Net Regional Migration: Net inflow-outflow of migrants into and out of the Regional Municipality for each time period.

The future behaviour of these factors cannot be determined exclusively on the basis of past trends, and "informed judgment" must be introduced to predict future conditions.

1/ PD 23/77, Regional Population Forecasts, March 7, 1977

2/ Population 1976-2001
Regional Planning and Development Series, Sept. 1978

PREVIOUS FORECASTS AND THEIR ASSUMPTIONS

Population forecasts presented in the Regional Official Policies Plan established a probable 2001 Regional population of between 614,600 and 531,200. These high and low projection estimates (Table 1) were based on birth rates as shown in Appendix 1, Table 1 and reflected Regional Council's decision that there be no arbitrary restrictions on growth to 1981, and therafter growth be limited to 2.5% per annum. The assumptions on net migration into the Regional Municipality ranged from 25,000 in 1971-76 to 12,000 in 1996-2001. 1/

In 1977, following release of 1976 data from the Census of Population, two facts became apparent. Firstly, the birth rate for the 1971-1976 period was lower than that previously assumed. Secondly, the actual volume of net migrants into the Regional Municipality between 1971 and 1976 was nearer to 21,000 than 25,000. On both accounts therefore, assumptions on birth rates and migration had to be adjusted accordingly. The revised birth rates are shown in Appendix 1, Table 2 which assumed a turn-around in birth rates in the post 1976 period. Based on these revised assumptions a new population forecast resulting in an estimated 2001 population of 539,887 was prepared (Table 1).

Results of the Ministry of Revenue population figures for 1976 and 1977 and released in 1978 showed that the birth rates which had been forecasted for the Regional Municipality were not emerging as expected and also that the actual levels of migration into the Regional Municipality were lower than forecasted. Based on both of these trends Regional staff decided to postpone the slight turnaround in the birth rate from the 1976 to 1981 period to the 1981-1986 time period as shown in Appendix 1, Table 3 and to reduce the previous migration assumption downwards (Appendix 2). These revisions gave a 2001 population for the Regional Municpality of 509,942 persons and were reported in September 1978. 2/ (Table 1)

1/ Regional Official Policies Plan. Appendix. Chapter 3

2/ Publication No. 1 Population 1976-2001
Regional Planning and Development Series, Sept. 1978

TABLE 1

COMPARATIVE POPULATION PROJECTIONS

	1971	1976	1981	1986	1991	1996	2001
I	254,030	297,810	351,500	412,100	478,000	546,400	614,600
II	254,030	297,200	337,500	390,500	439,400	486,200	531,200
III	254,030	294,162	339,583	387,412	439,141	490,343	539,887
IV	254,030	290,602	331,203	372,813	418,600	464,015	509,942

I = Regional Official Policies Plan (High Forecast)

II = Regional Official Policies Plan (Low Forecast)

III = Refined Regional Official Policies Plan (PD 23/77)

IV = Regional Planning and Development Series Report No. 1 Population. September 1978

It should be noted that the population data on which these projections were based came from the Canada Census of Population tabulations for the Regional Municipality of Waterloo. This poses some problems. The Census traditionally occurs as of the first day of June in the appropriate year. However, on that date most of the university students studying in the Regional Municipality but whose permanent home address is outside the Region, would not be around to be counted because of summer vacations. This is an important qualifier because in this Regional Municipality there are two universities which have a distinct impact. For planning purposes and in terms of student population impacts on transportation systems, off-campus housing, water consumption treatment of sewage effluent and solid waste disposal, shopping and personal service facilities and recreational areas to name a few, this difference cannot be ignored.

THE PROVINCIAL PROJECTION

During 1979, Regional staff maintained a close liaison with the staff of the Ontario Statistical Centre in order to obtain as much information as possible on the assumptions of that agency for future population trends in Ontario generally, and for the Regional Municipality of Waterloo in particular. Regional staff attended a seminar in May 1979 where the Provincial Government assumptions were discussed and circulated. Subsequently staff obtained on a special request the detailed fertility, mortality and migration assumptions applicable to the Regional Municipality of Waterloo.

TABLE 2

PROVINCE OF ONTARIO PROJECTIONS

FOR THE

REGIONAL MUNICIPALITY OF WATERLOO

	1976	1981	1986	1991	1996	2001
Ontario Statistical Centre	289,129	325,871	362,248	397,179	429,893	460,205

Table 2 above is the current "most likely" population forecast for the Regional Municipality of Waterloo as prepared by the Ontario Statistical Centre.

The methodology adopted by the Province forecasts population for Ontario and thereafter distributes the Provincial total among member Counties and Regions. The forecasts by Regional staff look at the Waterloo Region primarily. This difference in methodology could account for some differences in results. Also, the Provincial projection is based on an average net immigration of about 13,000 persons per five year period and the total fertility rate was assumed to continue falling from 1.8 in 1976 to 1.5 in 2001.

Following publication of the 1979 Assessment Population figures for the Regional Municipality of Waterloo of 300,719 it became evident that the Ontario Statistical Centre 1981 projection of 325,871 would not be attained. This was due primarily to a fall-off in migration into the Region. If the migration rate between 1976-1979 were extended to 1981 the derived migration over the five year period was to be only 5,000 persons - as compared with nearly 20,000 in the 1971-1976 period. An indepth look was required.

1980 REGIONAL POPULATION PROJECTIONS

The population picture within Waterloo Region is changing much more quickly than previously assumed. Recent population figures lead to the conclusion that new residents are not moving to the Region in the numbers they previously did, nor as expected, and also that existing residents are moving away in numbers never previously contemplated.

Other major variables contributing to growth are fertility and mortality. It is now expected that the number of births per 1,000 women of childbearing years (fertility), will slowly level off and show some slight increases due to a combination of age composition of the population, economic and social factors. Due to continuing improvements in medical care, nutrition, etc., the mortality rate is expected to continue to decline.

This Regional Municipality also possesses considerable growth advantages and the history of the area demonstrates a strong relationship between economic growth and immigration and this can affect our population projections.

Migration

Migration into and out of the Regional Municipality of Waterloo is directly influenced by economic opportunities and the quality of life in the Region. Simultaneously, decisions to migrate are influenced by competing opportunities elsewhere. Migration will also be determined by national policies to relax or to restrict admittance into the country. We have assumed that the current economic slump within the Regional Municipality will continue at least to 1981. This is based on the continuing effects of the Provincial economic slump which affects expansions and curtails new investments. These assumptions are also based on reports by the Conference Board and other economic agencies and government departments.

However, because of the advantages of location to existing large markets, a diversified economic base, and the ability to service the emerging designated growth centres in Southern Ontario such as Nanticoke and Douglas Point, a slight increase in the economy particularly in the service industrial sector within this Regional Municipality, may be possible between 1981-1986.

A modest increase in growth need not be due to an influx of new residents from outside the Region to areas within the Region. It could equally be due to improved opportunities for job seekers within the Region resulting in them remaining rather than moving away in search of employment. However, this can only be accomplished if first our Province manages to slow its economic decline which will be difficult as we are tied so closely to our southern

neighbour and the economic situation federally. But it is not entirely the responsibility of the Province to look after each municipality and so they too must take strong concerted action. If the Provincial economy does not improve after 1981, then even with the best efforts at the municipal levels, the necessary economic growth will not be generated and the projected migration assumptions will not be valid and this holds true for this Regional Municipality as well.

After 1986 the pattern of migration will be due principally to whether or not a general economic recovery occurs, and whether or not the Area Municipalities individually or even together, can take advantage of any opportunities which might arise.

For purposes of projecting we have assumed that if the above discussed conditions occur and if all required facilities are in place then the Area Municipalities could, starting in 1986, experience a modest increase in migration levels.

If economic conditions as indicated above do not materialize, the effect of these assumptions is to postpone further into the future, the benefits derived from planning for these target populations and the Region will not meet the 2001 projections assumed.

It is not particularly wise to project too low because if economic assumptions do take place and our projections are low then the staging and development of all major services will be retarded and needed capacities not available when needed leading to major problems in financing and taking advantage of any new job opportunities that could be available.

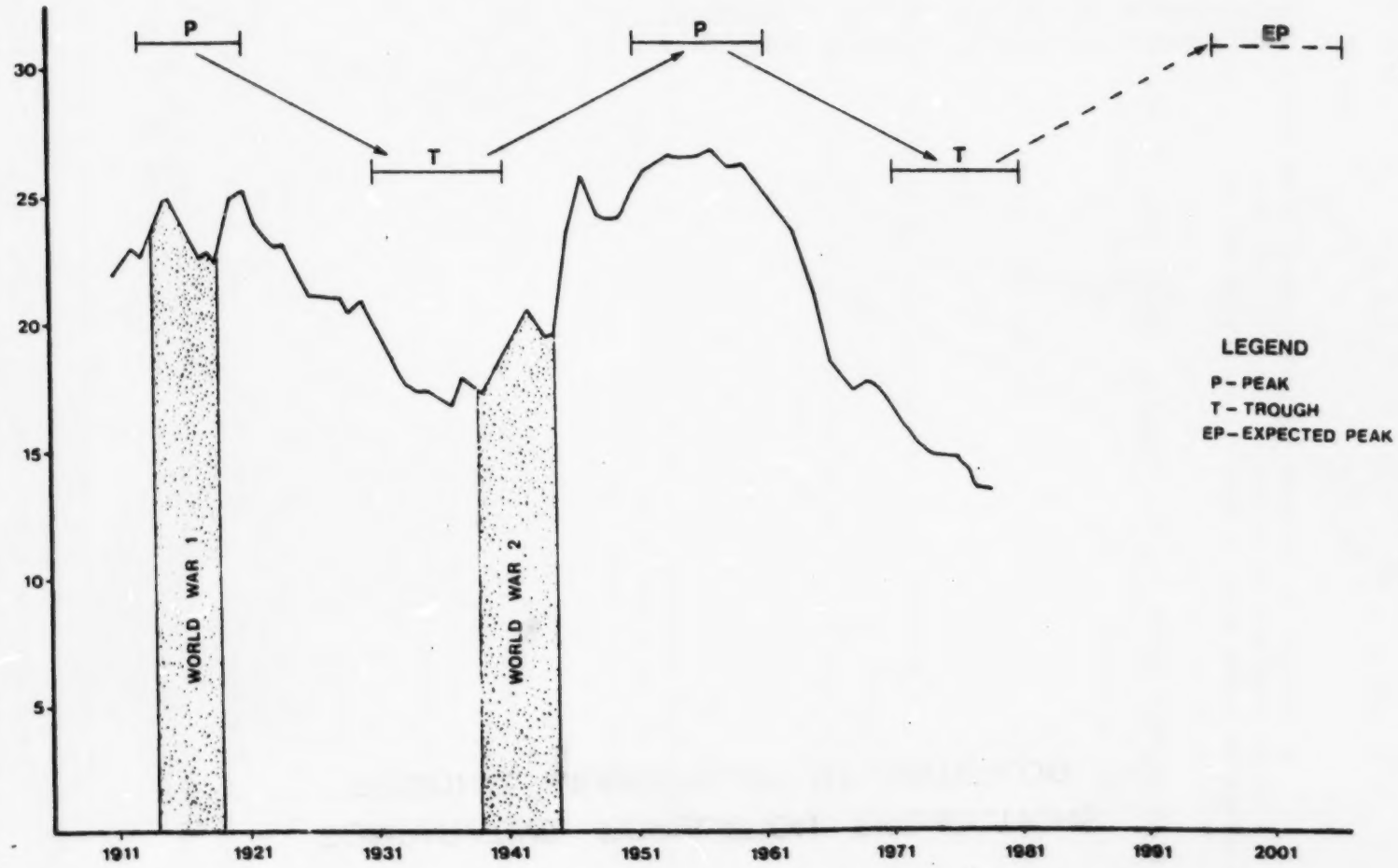
The migration assumptions used in these forecasts are shown in Appendix 2.

Revised Fertility Assumptions

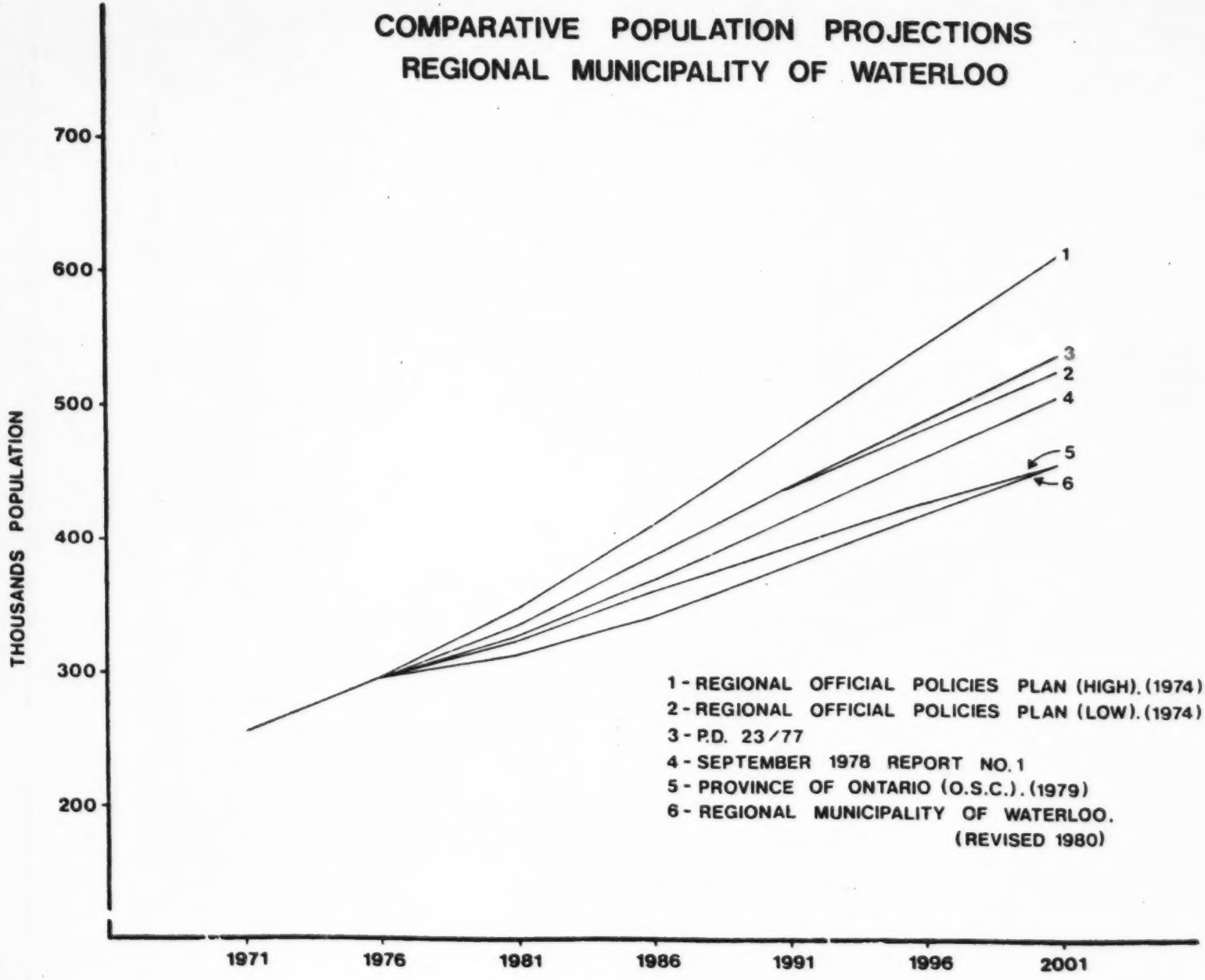
Trends in the number of births per 1000 women of childbearing years (fertility) are as much due to social factors as to economic factors. For example, if it is necessary for housewives to enter the labour force in order to maintain real family incomes in the face of inflation then one can expect the birth rate to decrease as Ontario and indeed Canada is now experiencing. If however, the decision of potential parents to have children is influenced by the pressures being experienced in establishing themselves in a job or at home then they could transmit that insecurity by not having children as is being suggested by leading sociologists in our Country as one of the reasons for the declining birth rate. Consequently, on this principle, where there is a surplus labour force there will be a lower birth rate and where there is a labour deficit there could be a higher birth rate. This pattern of "peaks and troughs" in the birth rate

ONTARIO: BIRTH RATE 1911 - 1977

BIRTHS / 1000 POPULATION



COMPARATIVE POPULATION PROJECTIONS
REGIONAL MUNICIPALITY OF WATERLOO



which tends to occur on a generation by generation cycle is shown in Figure 1 and the basis for a turnaround assumption in the post 1986 period can be foreseen if past trends show up again in the future.

There are of course several other related issues which affect birth rates.

These include:

- Marriage and divorce rates
- Family Law changes
- Community involvement in child care and welfare programs
- Employment codes allowing employees to leave and re-enter the labour force without penalty for maternity purposes
- Social attitudes to the family

The importance and impacts of these cannot be plugged into a model yet they have profound implications for emerging trends in population and ones which we must constantly monitor in order to keep our projections up to date.

The fertility assumptions now being used are set out in Appendix 1, Table 4 and are very close to present Provincial assumptions up to 1981. After 1986, Regional staff have assumed a slight turnaround in fertility for the reasons explained above but as mentioned previously, if the economic situation continues we must make adjustments annually.

Death Rates

Death rates and the effects of improvements in health care have been accommodated into the model using existing Provincial assumptions for Ontario, without modification. (Appendix 3)

Results of these assumptions applied to the Waterloo Region Cohort Survival Model 1/ is shown below.

1/ Please see Appendix 4 for a brief explanation of the operation of the model, its data requirements and the Cohort Survival technique.

TABLE 3

REGIONAL POPULATION FORECAST 1976 - 2001

	1976	1981	1986	1991	1996	2001
Revised Forecast 1980	289,125	312,220	342,404	381,908	421,498	460,442

This revised forecast places the 1981 population forecast of 312,220 much more realistically in terms of the 1979 population levels from the Ministry of Revenue.

Up to 1986, the forecasts of population are presented with much more confidence than those after 1986. However, even here, between 1981 and 1986 the groundwork must be laid to arrest the outflow of job-seekers by providing a wider range of job opportunities or the 1986 population projection will not be reached.

After 1986 the projection is presented as a guide since it will be considerably affected by Provincial and Federal policies on the economy and migration, as well as specific investment policies to designated areas by Senior levels of Government, such as to Western Canada by the Federal Government and Nanticoke and other areas by our Province.

AREA MUNICIPALITY ALLOCATIONS

The revised population forecasts have been distributed among the seven Area Municipalities bearing in mind the 1976-1979 share each Municipality had of the Regional total, the recent rate of growth of each Municipality, and the recent levels of building permits issued, particularly in the Townships.

TABLE 4

REGIONAL POPULATION BY MUNICIPALITY
1976 - 2001

	1976	1981	1986	1991	1996	2001
Cambridge	72,385	78,662	85,304	95,926	106,421	116,736
Kitchener	131,870	138,826	153,274	172,193	191,032	209,032
Waterloo	46,625	55,645	63,381	71,182	78,970	86,624
North Dumfries	5,054	5,000	5,088	5,328	5,568	5,808
Wellesley	6,415	6,891	7,289	7,884	8,479	9,074
Wilmot	10,560	10,846	11,187	11,847	12,507	13,167
Woolwich	16,240	16,350	16,881	17,896	18,891	19,896
	289,125	312,220	342,404	381,908	421,494	460,462

With reference to an adjustment for student population, Regional staff conducted a sample survey of university students by place of residence in order to determine in which municipalities they should be placed. Students giving a Regional Municipality of Waterloo address as their permanent address were not sampled since it is assumed that they would have been enumerated in the Census of Population and thus be already included. Based on this survey an additional population of 10,216 students should be added to the City of Waterloo population and 2,458 students should be added to the City of Kitchener population. As a Community College it was assumed that the vast majority of students at Conestoga College were resident at home, and because of this no adjustment was considered necessary.

Regional staff were advised that neither university envisaged major increases in the level of student enrollment in the future. For purposes of projections, the present distribution of the student population was carried through to the year 2001.

TABLE 5

REGIONAL POPULATION BY MUNICIPALITY
(INCLUDING UNIVERSITY STUDENTS)
1976 - 2001

	1976	1981	1986	1991	1996	2001
Cambridge	72,385	78,662	85,304	95,926	106,421	116,736
Kitchener	134,328	141,284	155,732	174,651	193,490	211,490
Waterloo	56,841	65,861	73,597	81,398	89,186	96,840
North Dumfries	5,054	5,000	5,088	5,328	5,568	5,808
Wellesley	6,415	6,891	7,289	7,884	8,479	9,074
Wilmot	10,560	10,846	11,187	11,847	12,507	13,167
Woolwich	16,240	16,350	16,881	17,886	18,891	19,896
	301,799	324,894	355,078	394,582	434,168	473,136

It must be emphasized that when comparing these projections to results from either the Census or the Assessment Division of the Ministry of Revenue, reference should be made to the projection which excludes University Students. However, the above table will be used in future planning within the Regional Municipality of Waterloo.

The next step is to redistribute the municipal projections into the many traffic zones as part of the input required to re-project the need and timing of regional road construction and widenings as well as re-project our water and sewer requirements. These projections are also utilized by School Boards, Utility Companies, Area Municipalities, the Development Industry and others. A following report on industry will fill in another data gap for the traffic zones - job opportunities and locations as well as new economic activity locations.

SOME POSSIBLE IMPLICATIONS TO CONSIDER

1. A basic objective of planning is to maintain and improve the quality of life available to residents of all municipalities within the Regional Municipality of Waterloo Planning Area. A major part of this requires that the community as a whole maintains its vibrant, dynamic and progressive attitude. This requires that residential, employment opportunities and leisure and educational activities are made available to meet the needs of existing and new residents. The necessity of too many young people having to move away in search of employment must be considered seriously. Current population trends show that this outflow of young residents, particularly first time job seekers, is occurring at an unprecedented rate and that this is principally due to a fall-off in job opportunities in the Region.

2. Studies show that of all Regions and Counties in Ontario which experienced a high rate of growth due to inflow of migrants between 1961 and 1976 only in the cases of the Regional Municipalities of Ottawa-Carleton, Waterloo and Niagara and the Counties of Middlesex and Wellington, could it be said that this attraction was essentially generated by internal growth as opposed to bedroom type development. (Appendix 5). There are therefore, natural advantages within this Region which can be exploited to at least maintain those opportunities and amenities which obviously affect population projections.

3. Present short term economic forecasts done by private and public experts at the Provincial and Federal levels, show that for Ontario as a whole there will be a falling-off in investment opportunities. However, specific areas in Ontario will likely not experience this decline to the same extent as others such as the Haldimand-Norfolk Area and Mississauga, due to many factors. Developments at Stelco and Ontario Hydro at Nanticoke and in the Peel Region for example, could influence a growth impetus in Southwestern Ontario and Municipalities in this Region, if ready to seize such opportunities can influence our population projections.

4. If Municipalities in this Region are unable for any reason to capitalize on these and other opportunities when they present themselves, the reputation of the Municipalities in the Region as dynamic and progressive could slip leading to a worsening economic situation as we get by-passed. We hasten to state however, that economic growth is only one important index of community health. We are only suggesting

that if opportunities do come to Ontario and to this general Region, we all must be ready to move quickly and if we manage to grasp the opportunities, if they come, then we can only realistically hope to maintain a stable economic growth at best. Considerable effort will be required by all concerned to get the Regional Municipality as a whole back to the modest growth experienced in the recent past.

5. Generally, the majority of Municipalities in the Regional Municipality appear well prepared to meet the residential land development requirements for any projected population. Attention is being given to resolving various servicing constraints being faced within the Regonal Municipality such as sewage plants in Elmira, New Hamburg and Ayr and future water requirements for Kitchener-Waterloo and with decisive action, solutions will be found for the short term as well as the long term. Recreational, commercial and institutional facilities are largely in place to meet foreseeable needs. The reservoir and tradition of skills, business services and diversified economic activities can be expanded as required. All this will influence population projections.

6. The population as we projected several years ago is still aging and the implications for increased social costs and varying markets for older populations are still pronounced.

7. The declining enrollments in the junior school years will still continue into the foreseeable future.

8. The number of people in the labour force will commence their decline in the next 5-10 years and unemployment declines will quickly follow which may bring shortages in specific areas of the labour force in the 1990's. This will affect industry and technology to handle a smaller labour force.

9. The retirement age at 65 will soon be eliminated.

10. Housing requirements are changing due to the changing population characteristics, mainly due to a lower household number, and which will again be influenced by energy conservation planning practices relative to housing density and design.

All of the above require constant monitoring and re-projecting because every physical land use, economic, social and cultural function and their projections are influenced even by minor changes in population characteristics and numbers.

This report was mainly researched and analysed by F. Watty with considerable input by the other Senior Staff, including the Directors and Commissioner.

Recommended By:

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Director of Planning and
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Approved By:

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APPENDICES

APPENDIX 1. Fertility Assumptions

2. Comparative Migration Assumptions

3. Mortality Assumptions

4. The Cohort Survival Model

5. Migration Share of Growth
   - Selected Counties and Regions

APPENDIX 1

FERTILITY ASSUMPTIONS

BIRTHS PER 1000 WOMEN PER YEAR OF CHILDBEARING YEARS

1. Regional Official Policies Plan

	15-19	20-24	25-29	30-34	35-39	40-44	45-49
1971-1976	37.9	152.3	142.2	81.9	37.8	10.7	1.5
1976	45.5	163.2	157.3	93.4	50.2	13.5	1.5
1981+	50.5	175.0	165.0	100.0	55.0	15.0	1.5

2. Regional Population Forecasts (PD 23/77)

	15-19	20-24	25-29	30-34	35-39	40-44	45-49
1971-1976	41.5	123.6	136.5	71.2	26.5	6.1	0.3
1976-1981	42.5	125.5	140.5	75.5	26.5	6.1	0.3
1981-1986	44.5	137.5	150.5	85.5	31.5	6.5	0.3
1986-1991	48.5	149.5	165.5	80.5	33.5	7.5	0.3
1991-1996	50.0	153.5	170.5	92.0	33.5	7.5	0.3
1996-2001	50.0	153.5	170.5	92.0	33.5	7.5	0.3

3. Population 1976-2001. Regional Planning and Development Series Report No. 1

1971-1976	41.5	123.6	136.5	71.2	26.5	6.1	0.3
1976-1981	41.5	123.6	136.5	71.2	26.5	6.1	0.3
1981-1986	42.5	125.5	140.5	75.5	31.5	6.5	0.3
1986-1991	44.5	137.5	150.5	85.5	33.5	7.5	0.3
1991-1996	48.5	149.5	165.5	90.5	33.5	7.5	0.3
1996-2001	50.0	153.5	170.5	92.0	33.5	7.5	0.3

4. Assumption January 1980

1976-1981	39.82	117.4	120.02	54.58	22.46	6.08	0.7
1981-1986	37.36	112.5	114.84	52.18	21.38	6.02	0.68
1986-1991	39.24	115.7	118.3	54.18	22.14	6.0	0.68
1991-1996	40.54	119.54	122.2	55.98	22.88	6.2	0.72
1996-2001	41.86	123.44	126.2	57.8	23.62	6.4	0.74

APPENDIX 2

COMPARATIVE MIGRATION ASSUMPTIONS

	REGIONAL PLAN HIGH	REGIONAL PLAN LOW	PD 23/77	POPULATION 1976-2001	POPULATION PROJECTIONS 1980
1971-76			21,309	18,000	-
1976-81			21,309	18,000	5,000
1981-86			18,000	16,000	12,000
1986-91			18,000	16,000	20,000
1991-96			16,000	14,000	20,000
1996-2001			16,000	14,000	20,000

APPENDIX 3

MORTALITY ASSUMPTIONS

ASSUMPTIONS

SURVIVORSHIP MALE

	1970.	1981.	1986.	1991.	1996.
0. TO 4.	0.9973	0.9973	0.9980	0.9981	0.9984
5. TO 9.	0.9990	0.9990	0.9991	0.9991	0.9992
10. TO 14.	0.9987	0.9987	0.9988	0.9988	0.9987
15. TO 19.	0.9952	0.9953	0.9959	0.9959	0.9964
20. TO 24.	0.9944	0.9944	0.9944	0.9944	0.9944
25. TO 29.	0.9957	0.9957	0.9958	0.9959	0.9959
30. TO 34.	0.9934	0.9934	0.9933	0.9936	0.9939
35. TO 39.	0.9920	0.9925	0.9929	0.9929	0.9930
40. TO 44.	0.9873	0.9870	0.9877	0.9877	0.9883
45. TO 49.	0.9803	0.9807	0.9808	0.9810	0.9812
50. TO 54.	0.9681	0.9681	0.9687	0.9687	0.9695
55. TO 59.	0.9474	0.9475	0.9485	0.9487	0.9493
60. TO 64.	0.9139	0.9139	0.9150	0.9152	0.9164
65. TO 69.	0.8729	0.8733	0.8752	0.8754	0.8766
70. TO 74.	0.8128	0.8128	0.8143	0.8151	0.8156
75. TO 79.	0.7390	0.7394	0.7409	0.7396	0.7397
80. TO 84.	0.6370	0.6371	0.6387	0.6376	0.6376
85. TO 99.	0.4413	0.4413	0.4413	0.4413	0.4413

SURVIVORSHIP FEMALE

	1970.	1981.	1986.	1991.	1996.
0. TO 4.	0.9979	0.9979	0.9984	0.9985	0.9987
5. TO 9.	0.9992	0.9992	0.9992	0.9992	0.9992
10. TO 14.	0.9992	0.9992	0.9992	0.9992	0.9992
15. TO 19.	0.9983	0.9983	0.9983	0.9983	0.9983
20. TO 24.	0.9980	0.9980	0.9980	0.9980	0.9980
25. TO 29.	0.9976	0.9976	0.9976	0.9976	0.9976
30. TO 34.	0.9972	0.9972	0.9972	0.9972	0.9972
35. TO 39.	0.9957	0.9957	0.9957	0.9957	0.9957
40. TO 44.	0.9933	0.9934	0.9934	0.9934	0.9934
45. TO 49.	0.9900	0.9900	0.9900	0.9900	0.9900
50. TO 54.	0.9842	0.9843	0.9844	0.9844	0.9844
55. TO 59.	0.9762	0.9764	0.9764	0.9765	0.9765
60. TO 64.	0.9650	0.9650	0.9659	0.9662	0.9663
65. TO 69.	0.9463	0.9473	0.9491	0.9489	0.9497
70. TO 74.	0.9140	0.9157	0.9183	0.9180	0.9191
75. TO 79.	0.8634	0.8676	0.8717	0.8715	0.8734
80. TO 84.	0.7819	0.7849	0.7875	0.7908	0.7933
85. TO 99.	0.6054	0.6077	0.6091	0.6122	0.6143

APPENDIX 4

REGIONAL MUNICIPALITY OF WATERLOO

POPULATION PROJECTION METHOD

COHORT-SURVIVAL TECHNIQUE

1. Program Description

The program is designed to project future populations from existing male and female populations by taking into account fertility rates, mortality rates and migration trends. The base population is divided into male and female populations and distributed by age category. For each five year population projection required, fertility rates are provided for all female categories, migration rates are divided into male and female groups and are inputted by age category, as are survivorship factors.

The program first takes the female base population and calculates estimated births and divides this into male and female births, taking into account survivorship factors. For both male and female categories for the base population, calculated mortality numbers are subtracted and migration numbers are added. The new population numbers generated for each age category are the population distribution for the first five year projection and now form the base population for the next five year projection. This process continues until all five year projections for which data has been inputted have been satisfied.

Data Input

- male population by age group for the base year (M)
- female population by age group for the base year (F)
- male survivorship factors for each age category for the base year and for each five year forecasted period (S.F.)
- estimated fertility rates for each age group of females for the base year and for each forecasted year (B.R.)
- estimated male migration numbers by age group for each five year forecasted period (MMIG)
- estimated female migration numbers by age group for each five year forecasted period (FMIG)
- ratio of male to female births for each forecasted period (Factor)

Input parameters

(a) NINT - number of five year intervals for which the population is being forecasted.

(b) LEN - length of interval being forecasted.

(c) N - number of age categories in which the population is distributed.

(d) NYEAR - base year

Format of Data Input

(1) Card 1 - Title card, 80 Alphanumeric places
(2) Card 2 - Title card
(3) Card 3 - parameter card, 4 five digit numbers are read, in order of parameters NINT, LEN, N and NYEAR.

If 'N' is greater than 16

(4) Cards 4, 5, 6 - numbers for the population distribution of males for the base year is read in on these cards. Eight ten digit numbers can be read in on each card in the following format:

- - - 6 5 4 3 2 1 0 / - - - - - 7 7 7 7 7 ... etc.
(1 - 10) (11 - 20)

(5) Cards 7, 8, 9 - numbers for the population distribution of females for the base year is read in on these cards. The same format as (4) applies.

For each five year interval, for which population projections are required, the following sets of cards should be provided.

(6) 3 cards - survivorship factors for the male population are read in on these cards. Eight ten digit numbers, including the decimal, can be read in on each card in the following format:

- - - - 9 8 7 6 5 4 / - - - - - . 8 8 7 7 ... etc.
(1 - 10) (11 - 20)

(7) 3 cards - survivorship factors for the female population are read in on these cards. The same format as (6) applies.

(8) 3 cards - fertility rates for each female age category are read in on these cards. The same format as (6) applies. Note, if the fertility rate for an age category is zero, a zero can be put in the last digit column of each number or the ten digit colums for that number can be left blank.

(9) 3 cards - male migration numbers for each age category are contained on these cards. The same format as (6) applies.

(10) 3 cards - female migration numbers for each age category are contained on these cards. The same format as (6) applies.

If there are 16 or less age categories only two cards rather than three are needed for (4) - (10) inclusive.

APPENDIX 5 MIGRATION SHARE OF GROWTH - SELECTED COUNTIES AND REGIONAL MUNICIPALITIES

	1961 - 1966			1966 - 1971			1971 - 1976		
	Natural Increase	Net Migration	Percent Migration	Natural Increase	Net Migration	Percent Migration	Natural Increase	Net Migration	Percent Migration
1. Ottawa Carleton	30,603	24,679	44.6	22,331	35,908	61.6	19,037	29,569	60.1
2. Durham* Region	14,113	23,595	62.6	11,344	15,004	56.9	10,982	19,061	63.4
3. Niagara Region	20,454	13,048	38.9	15,321	7,090	31.6	11,158	6,952	38.4
4. Peel* Region	13,264	47,482	78.2	17,077	70,476	80.5	23,742	92,294	79.5
5. Metro Toronto	133,070	130,495	45.5	112,679	92,128	45.0	87,894	-53,322	-
6. Waterloo Region	16,278	23,696	59.3	15,820	22,133	58.3	15,676	18,772	54.5
7. York* Region	8,373	13,634	62.0	6,142	23,590	79.3	7,380	30,475	80.5
8. Halton* Region	11,743	22,558	65.8	10,690	27,237	71.8	11,288	27,358	70.8
9. Wellington County	5,877	3,598	38.0	4,929	9,621	66.1	5,136	9,876	65.8
10. Middlesex County	16,265	11,716	41.9	13,050	19,561	60.0	12,119	9,612	44.2
11. Essex County	18,284	5,864	24.3	15,189	10,286	40.4	12,468	-8,503	-
12. Hamilton-Wentworth	25,970	9,024	25.8	18,765	-701	-	13,673	-5,422	-
13. Haldimand-Norfolk	4,550	-2,624	-	2,969	3,147	51.4	2,316	222	8.7

* Strong impact of Metropolitan Toronto